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ABSTRACT

This brief report summarizes a study to identify primary bound conditions of sound level selection as a first step in collecting base-line data for evaluating selective listening performance in infants with known or suspected hearing loss. Ten normal 9 to 22 month old infants in their home cribs played with an automated operant "toy" that allowed them to choose between programs of nursery songs at two different loudness levels. In a two-phase record with more than 60,000 seconds of listening response time, the infants showed a highly significant preference for the louder feedback when the loudness levels differed by about 30 decibels. No preference pattern was shown when the difference in loudness levels was only 10 decibels. (Author/JS)

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Automated Home Measurement of Infants

Preferential Discrimination of Loudness Levels

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ABSTRACT

Ten normal infants in their home cribs played with an automated operant "toy" that allowed them to choose between programs of nursery songs at two different loudness levels. In a two-phase record with more than 60,000 seconds of listening response time the babies showed highly significant preference for the louder feedback when the loudness levels differed by about 30 dB. They showed no preference pattern when the difference in loudness levels was only 10 dB.

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Automated Home Measurement of Infants'

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Ten normal infants in their cribs at home played in multiple sessions with an automated two-choice "toy" that allowed them to select between two tracks of a stereo tape player programmed with audio stimuli at two different loudness levels. The purpose of the study was to identify primary boundary conditions of sound level selection in this setting as a first step in collecting baseline data for evaluating selective listening performance in infants with known or suspected hearing loss. (See, Friedlander and Whitten, ASHA submitted summary, 1970)

The infants were five boys and five girls whose ages ranged from 9 to 22 months (mean 13.1 months). All the babies were in good health and were judged to be at or ahead of the developmental status appropriate for their age. There was no evidence or reason to suspect the presence of any hearing deficits. All families were faculty, students, or in other professional strata in the university community. Of the original group of 12 infants, two babies were dropped from the study because of performance artifacts unrelated to the status of the hearing.

Each baby had access to two large manipulable knobs attached to opposite sides of the crib. A 9" x 12" polyplanar speaker was mounted on one side of the crib. Underneath the crib were a stereo tape player, a two-channel central control unit with a response register, and an automatic time clock that turned on the system each morning about 30 minutes before the infant normally awakened.

The system operated continuously when the baby was awake in the crib, but he could hear audio feedback through the loudspeaker only when he manipulated either of the two large knobs with a force greater than 2 oz.. The feedback lasted for as long as the infant maintained force on the knob. The response register recorded the number and duration of the responses on each of the two knobs, indicating the number of seconds the infant could listen to either channel supplied by the stereo tape player.

The audio stimulus material consisted of ordinary children's music and nursery songs, selected to exclude extremes of dynamic range. The two channels were adjusted to play exactly the same material at all times, but at two different loudness levels.

In the standard procedure, from which there were a few very minor variations, each infant had one of the test systems attached to his crib for at least 12 days. This period was divided into two six-day phases. In the first phase one audio feedback channel played at 35-37 dB and the other played at 63-65 dB. In the second phase, one channel played at 44-45 dB and the other at 54-55 dB. (Sound level measurements were made on the A scale of a B & K model 2203 sound level meter. Background noise levels in the babies' rooms in the different homes was in the 27-32 dB range.) Alternate selections of music of the same general type but with different songs were played in the two phases. These selections were presented in counter balanced order and the procedure was conducted according to a standard experimental paradigm.

The babies' response output varied greatly from day to day and from child to child, but the data were essentially unambiguous in their indications of 1) preferential selection for the louder feedback in Phase A, which offered the greater difference between the two loudness levels, and 2) non-

preference in Phase B which offered the lesser difference in loudness levels. The total data array was extremely rich in its information on the children's patterns of listening responses. This summary is highly synoptic in presenting only the main observations.

In Phase A all the babies made more responses to listen to the 63-65 dB feedback than to hear the 35-37 dB feedback, which was only slightly above detection threshold against the ambient noise background. The mean ratio of individual preferences for the louder feedback was slightly greater than 4:1. The range of total response output was from 1,500 seconds for the infant who listened least, to 9,069 seconds for the baby who listened most. The mean listening response times were 929 seconds for the low level feedback and 3,313 seconds for the high level feedback. For the group as a whole, counting all responses and all babies, preference for the louder feedback was significant beyond the .001 level by the binomial test.

In Phase B, when the two sound levels were separated by only a 10 dB difference, and the lower level was clearly above detection threshold, the infants' performance was characterized by greater variability and there was no clear pattern of discriminative selection between the two feedbacks. About half the babies made more seconds of listening responses for the 44-45 dB feedback than for the 54-55 dB feedback. The mean of the individual preference ratios was a bare 1.1:1 in favor of the louder feedback--in effect, no preference at all. The range of total listening responses in Phase B was from 386 seconds to 17,133 seconds, and the means were 1,646 seconds for the lower level sound and 2,289 seconds for the louder feedback.

The complete report includes a far more extensive examination of the response data, analyzed in terms of implications for more refined evaluation of listening preferences for normal infants and babies with suspected hearing disorders.

TABLE

Automated Home Measurement of Infants'

Preferential Discrimination of Loudness Levels

				PHASE A: Listening Response Time (seconds)			PHASE B: Listening Response Time (seconds)		
	Infant	Sessions	Age	36 dB	64 dB	Total	45 dB	55 dB	Total
GIRLS	1	6	9.5 mos.	605	1,704	2,309	1,132	1,085	2,217
	2	7	11.5	919	8,150	9,069	6,518	10,615	17,133
	3	6	16.5	346	1,306	1,652	165	221	386
	4	7	20.0	2,124	3,044	5,168	2,108	2,363	4,471
	5	6	9.0	72	262	334	99	118	217
	Girls' Totals			4,066	14,466	18,532	10,022	14,402	24,424
	Girls' Means		13.3	813	2,893	3,706	2,004	2,880	4,885
BOYS	6	7	11.0	361	1,224	1,585	469	362	831
	7	6	11.0	1,494	3,723	5,217	662	882	1,544
	8	6	22.5	292	2,950	3,242	474	496	970
	9	6	11.0	1,294	4,404	5,698	2,735	1,000	3,735
	10	6	9.0	758	1,001	1,759	670	1,145	1,815
	Boys' Totals			4,199	13,302	17,501	5,010	3,885	8,895
	Boys' Means		12.9	840	2,660	3,500	1,002	777	1,779
GRAND TOTALS				8,265	27,768	36,033	15,032	18,287	33,319
GRAND MEANS			13.1	827	2,777	3,603	1,503	1,829	3,332